

## 6. ASSESSMENT OF POTENTIAL IMPACTS ASSOCIATED WITH THE WITH THE PROPOSED TRANSMISSION LINES BETWEEN THE IKAROS AND BIGHORN SUBSTATIONS, AND THE EXTENSIONS TO BIGHORN SUBSTATION

The existing Trident-Bighorn 275 kV Transmission line passes through the preferred area for the location of the proposed Ikaros Substation. This provides a possible corridor for the new 400 kV Transmission lines between the proposed Ikaros Substation and the existing Bighorn Substation parallel to this existing line. Detailed studies undertaken within the Environmental Impact Assessment investigated this corridor (to the south of the existing Trident-Bighorn 275 kV lines) for the establishment of the new Transmission lines between these two substations.

The Bighorn Substation will require an additional 400 kV line bay in order to accommodate the new Transmission lines. This extension work will require the expansion of the substation site, which will require additional land adjacent to the existing site.

### 6.1. Potential Impacts on Transmission Line Components associated with Climate and Atmospheric Conditions

Potential impacts on substation and Transmission line components associated with climate and atmospheric conditions are discussed in Sections 4.1 and 5.1 respectively.

**Table 6.1:** Potential impacts on substation and Transmission line components associated with climate and atmospheric conditions

Nature	Extent	Duration	Probability	Significance	Status
Local climate	Local	Long-term	Low	Low	Negative
Extreme weather conditions	Regional	Short-term	Low	High	Negative
High wind speeds	Local	Short-term	Low	High	Negative
Pollution	Local	Long-term	Low	High	Negative

### 6.2. Potential Impacts associated with Geology and Soils

Potential impacts on geology and soils are discussed in Sections 4.2 and 5.2. The expansion of the Bighorn Substation may potentially be restricted by the occurrence of rocky outcrops.

**Table 6.2:** Potential impacts on substation and Transmission line infrastructure associated with geology and soils

Nature	Extent	Duration	Probability	Significance	Status
Erosion potential at tower positions/substation site	Local	Long-term	Low	Moderate	Negative
Erosion potential along access/service roads	Local	Long-term	Low	Moderate	Negative

### 6.2.1. Recommendations

It is recommended that a detailed geotechnical study be undertaken of the proposed area for expansion prior to the commencement of construction.

## 6.3. Potential Impacts on Agricultural Potential

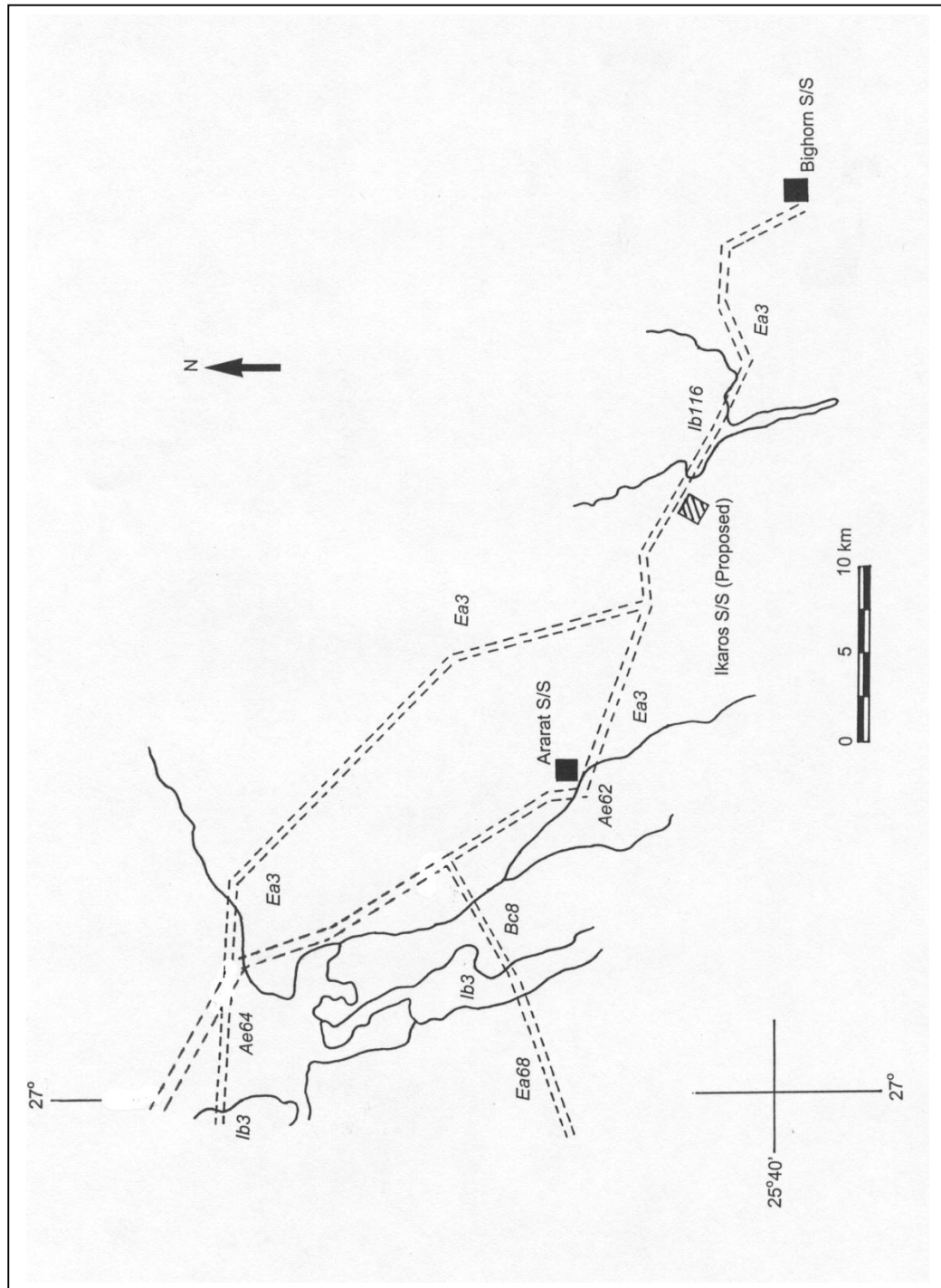
The proposed route crosses the following land types:

- Ea3 (black, swelling clays)
- Ib116 (rocky area),

The proposed corridor is indicated in Figure 6.1 by the double dashed lines, and the land type boundaries are indicated as single solid lines.

Land type Ib116 contains mainly rock and shallow soils, and has a low agricultural potential. This land type is, however, characterised by steep slopes. This will have implications regarding erosion potential and the positioning and type of towers. Therefore, steep slope areas should be identified in the final design stage of the project, and appropriate mitigation measures should be included within the EMP in order to minimise erosion potential.

Land type Ea3, which accounts for the majority of the proposed corridor, consists mainly of fairly deep, black, swelling clay (turf) soils, which have a moderate agricultural potential. The mainly smectitic nature, with consequent shrinking and swelling properties, of the Arcadia (turf) soils means that there is a narrower moisture range for cultivation than other agricultural soils. If the swelling clay soils become wet, the pores fill up, they saturate easily and drain slowly, causing anaerobic conditions (especially under irrigation) and a deficit of oxygen in the root zone. If allowed to dry out, however, these soils can crack, damaging roots.



**Figure 6.1:** Land type boundaries (single solid lines) shown in relation to the proposed Transmission line corridors (double dashed lines)

Surface crusting is also a potential problem, due to the swelling and sealing nature of the soils, which can lead to increased infiltration rates. However, the black clay soils are naturally fertile, with high cation exchange capacities and high organic carbon contents. If well managed, they can be productive soils.

There is also a significant proportion within this land type where rock outcrops and shallow soils occur.

**Table 6.3:** Potential Impacts on agricultural potential associated with the construction of new Transmission lines between the Ikaros and Bighorn Substations and the extension of Bighorn Substation

Nature	Extent	Duration	Probability	Significance	Status
Construction of towers	Local	Long-term	Likely	Low	Negative
Steep slopes and erosion potential	Local	Long-term	Likely	Moderate	Negative

### 6.3.1. Recommendations

In order to limit the potential impacts on agricultural potential, it is recommended that the Transmission lines between the proposed Ikaros Substation and the existing Bighorn Substation be constructed as close as possible south of the existing Trident-Bighorn 275 kV Transmission line .

## 6.4. Potential Impacts on Flora and Terrestrial Fauna

The norite hill complex, east of Rustenburg (east of the proposed Ikaros Substation site on the Boschpoort and Beestkraal farms) was identified as a “hot spot” in terms of flora and fauna during the Scoping Phase. This was confirmed as a highly sensitive area during more detailed studies undertaken within the EIA studies. This site is considered to be the centre of distribution of *Erythrophysa transvaalensis*, a Red Data species restricted to the North West Province.

This specific plant species has, however, suffered serious damage in the recent past. Complete hills have been destroyed through mining/quarrying activities, and the ecological functioning of the whole complex has been seriously disturbed. Rehabilitation efforts appear either non-existent or superficial and wholly inadequate. To prevent the total loss of this natural site, urgent steps will have to be taken by the relevant authorities.

Due to the 500 m (as a minimum) distance restriction of powerlines to rock blasting operations, construction of the proposed powerline may assist in conserving the remaining habitat to the south of the proposed corridor. The Transmission line could, therefore, play an important role in the conservation of this highly vulnerable species over the long-term.

In general, the vegetation within the corridor is highly fragmented as a result of mining, cultivated lands, roads and urban development. The condition of the natural vegetation is considered to be reasonable to poor according to management practices. No flora or fauna species of concern were identified within the proposed corridor.

**Table 6.4:** Potential impacts on fauna and flora associated with the construction of new Transmission lines between the Ikaros and Bighorn Substations and the extension of Bighorn Substation

Nature	Extent	Duration	Probability	Significance	Status
Red Data species within corridor	Local	Permanent	Unlikely	High	Negative
Red Data species in norite hill complex	Local	Permanent	Likely	High	Positive
Clearance of servitude	Regional	Long term	Definite	Low	Negative
Clearance of tower footprint	Local	Permanent	Definite	Low	Negative
Clearance of substation extension	Local	Permanent	Definite	Low	Negative

#### 6.4.1. Recommendations

In order to minimise potential impacts on flora and fauna, it is recommended that the new 400 kV Transmission lines between the proposed Ikaros Substation and the existing Bighorn Substation should, as far as possible, be constructed parallel to the existing Trident-Bighorn 275 kV line.

In order to assist contractors in the identification of any sensitive flora and fauna species which may be encountered during the construction phase, the following generic mitigation measures are proposed:

- Prior to the commencement of construction, a detailed survey of the final Transmission line alignment should be undertaken in order to confirm the absence of Red Data and/or protected species.
- Special environmental provisions should be included in construction agreements. This should include:

- \* Penalties for removal and/or destruction of threatened species for any reason (firewood, medicinal use, collectors value etc) should be agreed upon beforehand.
- \* A protocol describing the actions to be followed if a threatened species is found should be in place.
- A baseline data set (list of probable rare, endangered or threatened) that could be encountered by the construction team should be drawn up.
- Rare/endangered/protected species which are found on the site may be relocated (to a similar location not more than 300 m from original location) before construction proceeds. The contractor must be assisted by an experienced person or organisation to ensure that the best option is exercised (i.e. relocation of the species individuals if possible or even removal for genetic propagation by an established institution such as the NBI, Pretoria).
- Mitigation measures, including pre-arranged agreements with specialist institutions/persons to deal with any threatened species found during construction, should be included in the Environmental Management Plan (EMP).
- Methods of eradication and control of alien and invader plant species should be included within the EMP.

## **6.5. Potential Impacts on Avifauna**

Potential impacts on avifauna associated with the construction of a Transmission lines within the proposed corridor are discussed in Section 5.5. Potential impacts associated with the extensions to Bighorn Substation are anticipated to be negligible as this existing substation imposes an existing impact on the area.

### **6.5.1. Recommendations**

As far as possible, the proposed new Transmission lines should be constructed in parallel with the existing Trident-Bighorn 275 kV Transmission line. This option will concentrate impacts along one corridor and will effectively not create new impacts, as resident birds will have become accustomed to the existing line and learnt to avoid it. Most of the collisions sensitive species have most likely already disappeared in and adjacent to the existing corridor or occur sporadically in very low numbers due to heavy human impacts (mines and settlements).

## **6.6. Potential Impacts on Land Use**

Potential impacts on land use associated with the construction of Transmission lines between the Ikaros and Bighorn Substations are similar in nature to those discussed in Section 5.6. Site specific issues are discussed below.

### **6.6.1. Towns and Settlements (formal and informal)**

- *Functional division*

The proposed corridor between the Ikaros and Bighorn Substations borders several extensions of Boitekong to the north of the town. This Transmission line corridor passes close to this town, but does not specifically pass over erven within the proclaimed township. Therefore, the anticipated impacts will be peripheral and could be avoided by minimal realignment to skirt the settlements rather than crossing over portions thereof. No towns or settlements are located in close proximity to the Bighorn Substation.

### **6.6.2. Farming (communal and commercial)**

- *Limitation of farming operations:*

The placement of towers on farm portions may restrict local access or movement during farming operations. This applies to central pivot irrigation schemes and access for crop-spraying aircraft. This would typically apply to the area around Bighorn Substation which is characterised by citrus farms (refer to Figure 3.9).

- *Loss of Agricultural Land*

Some agricultural activities, such as maize farming, are permitted to continue within powerline servitudes, but other forms of farming (e.g. citrus farming) may pose problems if the trees grow too high (more than 4 m in height). The area around Bighorn substation (Marikana) is largely characterised by citrus farming. The 110 m wide servitude required for the Transmission lines may, therefore, restrict farming activities in the area around Bighorn Substation. Design and construction standards should be adapted to suit site-specific circumstances.

The base plinths of the self-supporting towers (to be used on a bend) take up substantial areas of valuable farm land which will be permanently lost to agriculture. The members of the cross-rope suspension tower, which is proposed to be used for the majority of the

Transmission line length, have a small footprint and will, therefore, have a very low, localised impact in terms of the loss of agricultural land.

### 6.6.3. Mining Areas

- *Possible restrictions on future mining operations:*

The servitude to be registered for the Transmission lines may potentially influence the development of mining operations where the Transmission lines passes in close proximity to existing mines (e.g. shafts, etc.). Anglo Platinum has expansion planned in the vicinity of the proposed Ikaros Substation, with new shafts being planned in the area.

Due to the 500 m (as a minimum) distance restriction of powerlines to rock blasting operations, future expansion of the mining/quarrying activities in the norite hill complex (located near the proposed Ikaros Substation site) could be limited as a result of the construction of the new Transmission lines.

**Table 6.5:** Potential impacts on land use associated with the construction of new Transmission lines between the Ikaros and Bighorn Substations and the extension of Bighorn Substation

Nature	Extent	Duration	Probability	Significance	Status
<i>Towns and Settlements</i>					
Functional Division	Local	Permanent	Probable	Medium	Negative
Possible Restriction of Access	Local	Short-term	Probable	Low	Negative
Possible Restriction of Development	Local	Permanent	Probable	Medium	Negative
Possible impact on planning policies and future development	Regional and Local	Short-term	Probable	None	Neutral
Possible safety risk	Local	Permanent	Highly probable	High	Negative
<i>Farming</i>					
Functional Division	Local	Permanent	Probable	Medium	Negative
Possible Restriction of access and movement	Local	Permanent	Probable	Medium	Negative
Sterilisation of agricultural land	Local	Permanent	Highly probable	Medium	Negative
Visual Impact	Local	Permanent	Definite	High	Negative
Possible Relocation of Houses/Structures	Local	Short	Probable	Medium	Negative
Possible Safety Risk	Local	Permanent	Probable	High	Negative



Nature	Extent	Duration	Probability	Significance	Status
Fences and Construction	Local	Short	Highly probable	Medium	Negative
Impact on Production	Regional	Short	Probable	Medium	Negative
<i>Mining</i>					
Possible Restriction of Extension of Existing Mines	Local	Permanent	Probable	Medium	Negative

#### 6.6.4. Recommendations

It is recommended that the proposed Transmission lines be constructed as close as possible to the south of the existing Trident-Bighorn 275 kV Transmission line in order to concentrate the impact on one servitude (if possible) and, therefore, minimise further impacts on land use.

Appropriate general mitigation measures are discussed in Section 5.6.5. Site specific mitigation measures are discussed below.

- *Loss of agricultural land:*  
The commercial citrus farming sector in the Bighorn substation (Marikana) area should be taken into consideration when planning the alignment of the Transmission lines through this area.
- *Possible restriction of extension of existing mines:*  
In order to prevent the restriction of future extensions of existing mines it is proposed that the final alignment of the powerlines be negotiated with the relevant Mining Group personnel who have information regarding future expansion plans. This is particularly important for those mines who do not own the surface rights, and so would not otherwise be negotiated with for compensation.

#### 6.7. Potential Impacts on Archaeological, Cultural and Historical Sites

The remains of a Late Iron Age stone-walled settlement appear on orthophotos at the base of a small hill (Site 1: 25° 38" 09' S; 27° 28" 00' E) on the northern border of the farm Swartkop (alias Swartkoppies 296JQ). More walling stands at the base of hill 231 (Site 2: 25° 38" 05' S; 27° 26" 56' E) at the north-west boundary of the same farm (refer to Figure 4.3).

Other walling (Site 3: 25° 37" 36' S; 27° 22" 20' E) appears on orthophotos on the boundary of Klipgat 281 JQ and Turffontein 302 JQ (refer to Figure 4.3). In this case, the walling is up on the edge of a large mountain range.

No archaeological, cultural or historical sites of significance were identified in the area proposed for the expansion of the Bighorn Substation. This area has been disturbed as a result of the construction of the existing substation, and therefore it is considered unlikely that any sites will be present in this area.

- *Significance*

All three stone-walled sites identified have medium significance.

**Table 6.6:** Potential impacts on archaeological, cultural and historical sites associated with the construction of new Transmission lines between the Ikaros and Bighorn Substations and the extension of Bighorn Substation

Nature	Extent	Duration	Probability	Significance	Status
<i>Construction impacts</i>					
Stone walling	None	None	Unlikely	Medium	None
Pot sherds	-	-	-	None	-

Until a precise alignment is selected, the impact of the project on individual archaeological sites cannot be accurately defined. Consequently, the probability of the impact can not be assessed at present, although the nature (construction), extent (local) and duration (permanent) of the impact, if it occurs, are clear (Table 6.6).

### 6.7.1. Recommendations

In order to minimise the potential for impacts on archaeological, cultural and/or historical sites, it is recommended that, as far as possible, the proposed Ikaros-Bighorn 400 kV Transmission line should be constructed parallel to the existing Trident-Bighorn 275 kV line.

The sites recorded during this archaeological assessment demonstrate the necessity for a detailed examination of the final route at final design stage. The distribution of archaeological sites typically forms a pattern, with open agricultural villages near watercourses with cultivatable soils, while stone-walled settlements stand at the base or on top of hills. Thus, a more detailed examination should concentrate on these localities.

Open pottery sites will not require further recording, unless burnt daga structures are also present. If towers (the only part of the project of archaeological concern) cannot be deviated to avoid burnt structures or a stone-walled site, then archaeologists need to excavate or otherwise record that area.

## 6.8. Potential Impacts on Aesthetics/Visual Quality

The new Transmission lines within this corridor are proposed to be constructed in parallel to the existing Trident-Bighorn 275 kV line for most of its length. This existing Transmission line presents an existing visual intrusion on the local area. In addition, the proposed Transmission lines are proposed to be constructed using cross-rope suspension towers, which are smaller, less steel-intensive, and less visually intrusive than those towers of the older, existing Transmission lines. Although the construction of new Transmission lines in parallel to this existing line will add to the existing impact, it is anticipated to be of low to moderate significance as a new corridor of linear infrastructure is not being established. Figures 5.5 – 5.7 indicate the potential visual impact associated with the construction of the proposed Transmission lines in the northern, southern, and N-S composite corridors respectively. The potential visual impact associated with the eastern leg is also indicated on these maps, and is influenced by the visual impacts associated with the eastern section of the Transmission line corridor (i.e. that associated with either the northern, southern or N-S composite corridor).

No potential impacts on nature areas are anticipated. Only one township development is potentially affected by this proposed corridor, i.e. Boitekong (cumulative impact as the Transmission lines and the substation site will alter the views in this area). Potential impacts on views of local landowners and farmers is also anticipated.

The potential impact on views from the Thekwane road is anticipated to be low as a result of the presence of the existing Trident-Bighorn 275 kV Transmission line, as well as mining infrastructure and township developments.

**Table 6.7:** Potential visual impacts associated with the construction of Transmission lines between the Ikaros and Bighorn Substations, and the extensions to Bighorn Substation

Nature	Extent	Duration	Probability	Significance	Status
Nature areas (Magaliesberg and Pilanesberg)	None	-	None	-	-
Townships	Local	Permanent	Probable	Low to moderate	Negative

Nature	Extent	Duration	Probability	Significance	Status
Tourism developments	None	-	None	-	-
Public routes (Thekwane road)	Local	Permanent	Probable	Low	Negative

### 6.8.1. Recommendations

In order to minimise the potential visual impacts associated with the proposed 400 kV Transmission line between Ikaros and Bighorn Substations, it is recommended that, as far as possible, this new line be constructed in parallel to the existing Trident-Bighorn 275 kV line.

## 6.9. Potential Social Impacts

The social impact assessment (SIA) variables associated with the proposed 400 kV Transmission lines to be constructed between the Ikaros Substation and the Bighorn Substation include the following:

- Impacts on the local population
- Infrastructure, farming and industrial activity-related impacts
- Public health, safety and security impacts
- Land use and the direct intrusion of the project on communities
- Aesthetic and tourism-related impacts
- Archaeological, cultural or historical sites impacts.

Those variables considered to be relevant to this component of the study are assessed as potential social impacts. The assessment considers the probability of the impact occurring and the actual (not perceived) impact, in respect of the construction and operation phases of the proposed 400 kV Transmission lines to be constructed between the Ikaros Substation and the bighorn Substation, as well as in respect of the extension of Bighorn Substation. The SIA is outlined in the tables overleaf, together with an indication of potential mitigation measures, as well as the significance of impacts with mitigation in place.

**6.9.1. Eastern Leg**

<b>Nature of impact</b>	<b>Relocation of individuals or families</b>	
Stage	Construction	Operation & Maintenance
Extent	Local	-
Duration	Permanent	-
Probability of occurrence	Improbable	-
Status of impact	Potentially high	-
Significance	High	-
Mitigation measure	In the event of communities being affected by the proposed corridor: First mitigation measure would be to re-align the final route alignment to skirt around the community and avoid households. Second mitigation measure would be to relocate affected households within the 110m servitude and to provide compensation to the affected households. Compensation will be required for re-settlement and loss of dwelling and/or land.	
Significance after mitigation	Low	-
Discussion	It is not likely that townships or settlements will be affected by the proposed corridor.	

<b>Nature of impact</b>	<b>Population impacts – inflow of temporary workers</b>			
Stage	Construction	Operation		
Extent	Regional – but mostly confined to construction camps	-	-	-
Duration	For the duration of the construction phase	-	-	-
Probability of occurrence	Highly probable, as construction for Eskom requires skilled labour	-	-	-
Status of impact	Negative	-	-	-
Significance	Moderate	-	-	-

Nature of impact	Population impacts – inflow of temporary workers		
Mitigation measure	The conduct of on-site workers must be specified to the Contractor. Specification are to include sanitation, water and waste (litter) as well as informal trading, and interfering in local community/cultural affairs.	-	
Significance after mitigation	Low	-	-
Discussion	Transmission line construction is specialist in nature, and specialist contractor teams will be required to be employed. The nature, extent and impact of this variable will depend on possible disruptions/intrusion/environmental impacts due to the presence of contractors (whether local or not) as well as potential clashes due to differences in racial and ethnic composition between locals and outside contractors. Historically, the introduction of contractors and construction camps is associated with a number of social and environmental problems. Such problems can include the erection of informal dwellings and allied problems such as lack of water, sanitation and waste disposal infrastructure, with concomitant health, environmental pollution and aesthetic impacts. These problems can be exacerbated in the event of an in- migration of job-seekers from elsewhere, who may set- up informal dwellings in the vicinity of the construction camps. The probability of this occurring is, however, slight, given the limited potential for employment at the site, and the more abundant opportunity for employment at the local mines. Moreover, it is common practice for local informal vendors (notably women providing cooked food) to enter the area, given the new business opportunity provided by the construction workers. Mitigation measures are required to be specified within the EMP provided to the appointed Contractors.		

Nature of impact	Disruption of farming activities	
Stage	Construction	Operation
Extent	Local	Local
Duration	Short term	Permanent
Probability of occurrence	Definite	Probable
Status of impact	Negative	Low
Significance	High	Low

Nature of impact	Disruption of farming activities	
Mitigation measure	<p>Close co-ordination with affected landowners and farmers will provide information on timed farming-related activities and associated timeframes (planting; harvesting, crop-spraying and breeding seasons). Where possible, the construction activities should be responsive to the needs and requirements of the farmers. Landowners/residents to be notified in advance regarding construction programme and type of activities to take place and equipment that would traverse the property. Procedures to be put in place in the case of compensation for maintenance; stock and crop losses.</p> <p>Provisions to be set for Contractors in this regard in the EMP.</p>	Not applicable
Significance after mitigation	Low	Low
Discussion	<p>In cultivated areas, construction and operation activities could exert a negative impact on farming activity (e.g. crop harvesting and irrigation; movement/access of tractors/other farm equipment) and result in crop losses. Clearance of land to facilitate construction and increased use of local roads (maintenance) and/or the creation of additional access roads (erosion risk), as well as livestock loss due to gates being left open by workers, could have financial implications for farmers. Similar impacts could result from maintenance activity during operation, when workers would have to access properties. An additional consideration is the potential restriction on growth and harvesting of crops in the servitude. Moreover, harvesting methods could be adversely affected due to mechanised harvesting equipment or crop-spraying aircraft not being able to negotiate the towers.</p>	

Nature of impact	Loss of agricultural land-use	
Stage	Construction	Operation
Extent	Local	Local
Duration	Short term	Permanent
Probability of occurrence	Improbable	Definite
Status of impact	Negative	Negative
Significance	Low	Low

Nature of impact	Loss of agricultural land-use	
Mitigation measure	Eskom is required to negotiate with each individual property owner regarding compensation and mitigation. The planned positions of towers are to consider those areas with least possible impact on land-uses, as well as minimising potential economic losses. Construction must be avoided during the planting, harvesting, crop spraying and animal breeding seasons within the proposed corridor.	Eskom's servitude must be properly maintained, although agricultural activities can still take place under the powerline.
Significance after mitigation	Low	Low
Discussion	The corridors traverse small individual properties which are undertaking farming activities. While it is not permissible for infrastructure to be erected within the servitude, most farming activities may continue. A servitude of approximately 110m is required for the two Transmission lines. The degree of loss of land is subject to the type of tower structure to be used and the nature and extent of construction activities. Harvesting in the long-term may also be disrupted due to the shape and footprint of the towers. The majority of the farming area lies in close proximity to Bighorn Substation. Therefore, cumulative impacts are highly probable, as three separate Transmission lines would traverse the area, with the establishment of the new lines.	

Nature of impact	Tourism related impacts	
Stage	Construction	Operation
Extent	Local	Regional
Duration	Short term	Not applicable
Probability of occurrence	Probable	Improbable
Status of impact	Negative	Negative
Significance	Low	None
Mitigation measure	Where practical, construction vehicles should avoid the use of primary tourist routes. Should an access road to a tourist destination be impacted during construction, a deviation road needs to be provided and clearly marked. The location of tourist operations are to be defined, so that construction camps are not established in such areas.	Cross Rose Suspension towers to be used as far as possible (to reduce visual impacts) and any possible negative environmental impacts to be kept to the minimum.
Significance after mitigation	None	None



Nature of impact	Tourism related impacts
Discussion	Whilst both construction and operation related activity could have an adverse effect on tourism operations, it is the towers which have an adverse aesthetic impact, which are anticipated to have the most marked impact, potentially rendering the area less attractive. These impacts have the potential to be tourism- site specific, but would also manifest <i>en- route</i> to such sites. There is a high probability of cumulative impacts during operation, given that the general area has a number of existing Transmission lines.

Nature of impact	Management of access routes, fences and gates	
Stage	Construction	Operation
Extent	Local	Local
Duration	Short term	Permanent
Probability of occurrence	Definite	Definite
Status of impact	Negative	Negative
Significance	Moderate	Potentially high
Mitigation measure	<p>Eskom are required to negotiate with individual landowners regarding maintenance of access roads, as well as with regards to compensation in the event of damage to existing infrastructure (e.g. fences) or stock losses.</p> <p>Access gates are to be closed after construction workforce has passed through in order to prevent any stock losses or unintended movement of cattle. Specifics regarding access control are to be individually agreed with the affected landowner.</p>	<p>Eskom are required to negotiate with individual landowners regarding maintenance of access roads, as well as with regards to compensation in the event of damage to existing infrastructure (e.g. fences) or stock losses.</p> <p>Fences and gates being installed must be of high quality to ensure durability. Eskom must ensure that:</p> <ul style="list-style-type: none"> <li>• access roads for maintenance purposes are kept in good travelling conditions and cleared of any obstructions;</li> <li>• fences are regularly inspected for any damages. Should any damages occur, repairs need to be done immediately.</li> </ul> <p>* gates to access roads must be closed after entering and exiting properties and locked. When access are not required, gates must be permanently closed and locked.</p>
Significance after mitigation	Low	Low

Nature of impact	Management of access routes, fences and gates
Discussion	The management of access roads, fences and gates is particularly important in areas where agricultural activities are being undertaken. Construction and maintenance will require access to properties along the servitude. This may result in increased deterioration of existing roads (should these be opted for), or erosion problems if appropriate maintenance measures are not implemented. In addition, if workers fail to close gates after entering a property, this would pose a risk of stock losses or ingress of animals from elsewhere.

Nature of impact	Electro-magnetic field health risks (role of proximity to source)	
Stage	Construction	Operation
Extent	Local	Local
Duration	Short term	Permanent
Probability of occurrence	Improbable	Definite
Status of impact	None	Negative
Significance	None	Moderate
Mitigation measure	Comply with Eskom Safety Standards by constructing the powerlines the correct height (ground to lowest point of powerline).	Comply with Eskom Safety Standards. The height of the conductors should ensure that EMF is zero at ground level.
Significance after mitigation	None	None
Discussion	Magnetic fields that naturally emanate from sources such as transmission lines are directly proportionate to the amount of current flowing on the transmission line at any given time. A higher loading condition such as may be present in hot weather summer months will result in increased magnetic field levels. According to the World Health Organisation (WHO) it has become increasingly unlikely (based on the existing body of research) that exposure to EMFs constitutes a serious health hazard, although some uncertainty remains. The WHO's statement derives from a study by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) (June 2001), which, using the standard IARC classification that weighs human, animal and laboratory evidence, classified ELF magnetic fields as <b>possibly carcinogenic to humans</b> based on epidemiological studies of childhood leukaemia. Evidence for all other cancers in children and adults, as well as other types of exposures (i.e. static fields and ELF electric fields) was considered not classifiable either due to insufficient or inconsistent scientific information.	

<b>Nature of impact</b>	<b>Health (HIV AIDS)</b>	
Stage	Construction	Operation
Extent	Local, regional	-
Duration	Short term (impact during construction, consequences potentially permanent)	-
Probability of occurrence	Probable	-
Status of impact	Negative	-
Significance	High	-
Mitigation measure	<p>Ambient environmental conditions during construction activities to be monitored by contractor. Appointed contractor to ensure that dust is kept to a minimum by implementing appropriate dust-suppression techniques.</p> <p>Oblige contractor to ensure that workers are educated on HIV/AIDS and that condoms are readily distributed. The local health services to participate to ensure education/condom distribution programmes.</p>	
Significance after mitigation	Low to None	-
Discussion	<p>Construction activities result in unnatural increases in local ambient pollution levels.</p> <p>An increase in the number of sex-trade workers and the spread of sexually transmitted infections (STIs) and HIV/ AIDS is increasingly being recognised as a risk associated with construction camps. Workers are separated from their families, and it is not uncommon for construction camps are frequented by local sex workers. This promotes the spread of STIs.</p>	

<b>Nature of impact</b>	<b>Safety &amp; security</b>	
Stage	Construction	Operation
Extent	Local, regional	Local, regional
Duration	Short term	Permanent
Probability of occurrence	Probable	Probable

Status of impact	Negative	Negative
------------------	----------	----------

Nature of impact	Safety & security	
Significance	High	High
Mitigation measure	<p><u>Construction worker safety:</u> implement safety management plans</p> <p><u>Community safety:</u> Community safety concerns to be identified by Contractor (or identify from the PPP). Workers employed and vehicles used should be readily identifiable as Eskom construction staff. Workers may be obligated to wear identity cards or corporate clothing to assist the community in identifying them as construction workers.</p> <p>All construction areas to be fenced off before any construction activities take place, access control to construction sites to be in place, and signage to be displayed indicating dangerous areas, etc. All construction materials and equipment to be safely stored. Construction materials to be guarded during operation. Road network to and from construction sites to be clearly marked. Construction company to have security on site at all times.</p>	<p>As per Construction Phase.</p> <p>Proper signage to be displayed indicating danger. Eskom to educate communities (minors and adults) regarding the danger of electricity and electricity infrastructure.</p>
Significance after mitigation	Low	Low
Discussion	<p>Safety consideration are of particular importance:</p> <p>Construction worker safety: Are a number of occupational safety risks associated with substation site construction, including the risk of electrocution. Compliance with the OH&amp;S Act would be required in terms of.</p> <p>Community safety: Potential risk of electrocution (people and livestock) if access to the construction site is not controlled. Safety and security threats posed by the presence of the construction camps/workers. Locals readily attribute increases in theft and other crimes to the presence of construction workers, particularly if these workers are from outside their area.</p>	

<b>Nature of impact</b>	<b>Noise pollution</b>	
Stage	Construction	Operation
Extent	Local	Local
Duration	Short term (construction period)	Permanent
Probability of occurrence	Definite	Improbable
Status of impact	Negative	Negative
Significance	Moderate to low (due to the nature of the area)	Low (due to proximity of residential areas)
Mitigation measure	Any drilling and other construction activities should be limited to daylight hours. No construction activities on weekends, especially when close to communities. Ensure that all machinery is in good order and complies with generally accepted noise levels. Any high impact activity (such as the use of dynamite to blast rocky outcrops) would require prior warning to adjacent landowners. The impact of blasting activities is considered to be low, due to the extensive quarrying which is undertaken north-east of the substation site..	Ensure that all maintenance vehicles and machinery is in good working order (e.g. silencers, etc) and complies with generally accepted noise levels.
Significance after mitigation	Low	None
Discussion	<p>Construction and blasting activities are not anticipated to have a significant impact on ambient noise levels due to the nature of the activities (mining and quarrying) in the local vicinity.</p> <p>The main noise associated with the operation of the Transmission line is a buzzing/humming noise which is exuded from the overhead lines. This noise is only perceptible when in close proximity to the lines.</p>	

<b>Nature of impact</b>	<b>Sites of cultural, religious, historical or archaeological significance</b>	
Stage	Construction	Operation
Extent	Local	-
Duration	Permanent	-
Probability of occurrence	Probable	-
Status of impact	Negative	-

Nature of impact	Sites of cultural, religious, historical or archaeological significance	
Significance	Moderate	-
Mitigation measure	Should any archaeological sites of significance be located within the defined route alignment, all possibilities need to be investigated to avoid the site. Contractor must also ensure that employees are aware of the various locations of archaeological sites in or close to the construction sites, and to mark these areas and to ensure that the construction workers do not traverse or disturb the site / area.	-
Significance after mitigation	Low	-
Discussion	Archaeological sites are protected by the National Heritage Resources Act (No 25 of 1999). It is an offence to destroy, damage, excavate, alter or remove from its original position, or collect and archaeological material without a permit issued by the South African Heritage Resource Agency. Note must also be taken of the National Heritage Council Act (No 11 of 1999).	

### 6.9.2. Bighorn Substation

Nature of impact	Relocation of individuals or families	
Stage	Construction	Operation & Maintenance
Extent	None	-
Duration	-	-
Probability of occurrence	None	-
Status of impact	-	-
Significance	-	-
Mitigation measure	-	-
Significance after mitigation	-	-
Discussion	No townships or settlements occur in close proximity to the substation.	

<b>Nature of impact</b>	<b>Population impacts – inflow of temporary workers</b>	
Stage	Construction	Operation
Extent	Regional – but mostly confined to construction camps	
Duration	For the duration of the construction phase	
Probability of occurrence	Highly probable, as construction for Eskom requires skilled labour	
Status of impact	Negative	
Significance	Moderate	
Mitigation measure	The conduct of on-site workers must be specified to the Contractor. Specification are to include sanitation, water and waste (litter) as well as informal trading, and interfering in local community/cultural affairs.	
Significance after mitigation	Moderate - Low	
Discussion	Substation construction is specialist in nature, and specialist contractor teams be will be required to be employed. The nature, extent and impact of this variable will depend on possible disruptions/intrusion/environmental impacts due to the presence of contractors (whether local or not) as well as potential clashes due to differences in racial and ethnic composition between locals and outside contractors. Historically, the introduction of contractors and construction camps is associated with a number of social and environmental problems. Such problems can include the erection of informal dwellings and associated problems such as lack of water, sanitation and waste disposal infrastructure, with concomitant health, environmental pollution and aesthetic impacts. These problems can be exacerbated in the event of an in- migration of job-seekers from elsewhere, who may set-up informal dwellings in the vicinity of the construction camps. The probability of this occurring is, however, slight, given the limited potential for employment at the site, and the more abundant opportunity for employment at the local mines. Moreover, it is common practice for local informal vendors (notably women providing cooked food) to enter the area, given the new business opportunity provided by the construction workers. Mitigation measures are required to be specified within the EMP provided to the appointed Contractors..	

<b>Nature of impact</b>	<b>Disruption of farming activities</b>	
Stage	Construction	Operation
Extent	None	No farming in substation site
Duration	-	-
Probability of occurrence	None	-
Status of impact	-	-



Nature of impact	Disruption of farming activities	
Significance	-	-
Mitigation measure	-	-
Significance after mitigation	-	-
Discussion	No agricultural practices are being undertaken in the area identified for the extensions of the substation.	

Nature of impact	Management of access routes, fences and gates	
Stage	Construction	Operation
Extent	Local	Local
Duration	Short term; temporary	Long-term; permanent
Probability of occurrence	Definite	Definite
Status of impact	Negative	Potentially High
Significance	Moderate	Moderate
Mitigation measure	Discussions with affected parties (local authority (roads), property owners, community leaders, etc) must take place before construction to inform them regarding the construction schedule and activities. Appointed contractor(s) to ensure that access to communities, property owners and public areas are provided and clearly marked (direction to which community / public place / public place).	Fences and gates being installed must be of high quality to ensure durability. Eskom must ensure that: <ul style="list-style-type: none"> <li>• access roads for maintenance purposes are kept in good travelling conditions and cleared of any obstructions;</li> <li>• fences are regularly inspected for any damages. Should any damages occur, repairs need to be done immediately.</li> <li>• gates to access roads must be closed after entering and exiting properties and locked. When access are not required, gates must be permanently closed and locked.</li> </ul>
Significance after mitigation	Low	Low
Discussion	The restriction access to the substation site is necessary to prevent both individuals and livestock from entering the area, so as to avoid potential injury. Limited access also minimises the opportunities for equipment tampering, and loss of operation of the substation.	

Nature of impact	Electro-magnetic field health risks (role of proximity to source)	
Stage	Construction	Operation
Extent	Local	Local
Duration	Short term	Permanent
Probability of occurrence	Improbable	Probable
Status of impact	None	Negative
Significance	None	Perception of affected parties: High
Mitigation measure	-	Strict adherence to existing national or international safety standards, and compliance with Eskom Safety Standards by constructing the substation to the correct specifications.  Incorporation of simple protective measures, such as the restriction of access around strong electromagnetic field sources to eliminate unauthorised access to areas where exposure limits may be elevated.  Consultation with local authorities and the public in siting new infrastructure, which will consider perceived fears and sensitivities, and assist in allaying fears.  Open communication and transparency with regards to known facts.
Significance after mitigation	-	Potentially Low
Discussion	The proximity of the source to local residents impacts on the severity of the concerns raised. The substation will not be constructed in close proximity to existing township developments, in accordance with Eskom's requirements, and therefore, the true impact is to be rated as low. Magnetic fields naturally emanate from sources such as substations and Transmission lines. According to the World Health Organisation (WHO, 2001) it has become increasingly unlikely (based on the existing body of research) that exposure to EMFs constitutes a serious health hazard, although some uncertainty remains. The WHO's statement derives from a study by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) (June 2001), which, using the standard IARC classification that weighs human, animal and laboratory evidence, classified ELF magnetic fields as possibly carcinogenic to humans based on epidemiological studies of childhood leukaemia. Evidence for all other cancers in children and adults, as well as other types of exposures (i.e. static fields and ELF electric fields) was considered not classifiable either due to insufficient or inconsistent scientific information.	

<b>Nature of impact</b>	<b>Health (Ambient conditions and HIV/AIDS)</b>	
Stage	Construction	Operation
Extent	Local, or regional	-
Duration	Short term – length of construction period	-
Probability of occurrence	Probable	-
Status of impact	Negative	-
Significance	Moderate	-
Mitigation measure	<p>Ambient environmental conditions during construction activities to be monitored by contractor. Appointed contractor to ensure that dust is kept to a minimum by implementing appropriate dust-suppression techniques.</p> <p>Oblige contractor to ensure that workers are educated on HIV/AIDS and that condoms are readily distributed. The local health services to participate to ensure education/condom distribution programmes.</p>	
Significance after mitigation	Low to uncertain	-
	<p>Construction activities result in unnatural increases in local ambient pollution levels.</p> <p>An increase in the number of sex-trade workers and the spread of sexually transmitted infections (STIs) and HIV/ AIDS is increasingly being recognised as a risk associated with construction camps. Workers are separated from their families, and it is not uncommon for construction camps are frequented by local sex workers. This promotes the spread of STIs.</p>	

<b>Nature of impact</b>	<b>Safety &amp; security</b>	
Stage	Construction	Operation
Extent	Local, regional	Local
Duration	Short term – for the duration of the construction phase	Permanent
Probability of occurrence	Probable	Probable

Status of impact	Negative	High
------------------	----------	------

Nature of impact	Safety & security	
Significance	Moderate	Low
Mitigation measure	<p>All construction areas to be fenced off before any construction activities take place, access control to construction sites to be in place, and signage to be displayed indicating dangerous areas, etc. All construction materials and equipment to be safely stored. Construction materials to be guarded during operation. Road network to and from construction sites to be clearly marked. Construction company to have security on site at all times.</p> <p>Community safety concerns to be identified by Contractor (or identify from the PPP). Workers employed and vehicles used should be readily identifiable as Eskom construction staff. Workers may be obligated to wear identity cards or corporate clothing to assist the community in identifying them as construction workers.</p>	<p>As per Construction Phase.</p> <p>Proper signage to be displayed indicating danger. Eskom to educate communities (minors and adults) regarding the danger of electricity and electricity infrastructure.</p>
Significance after mitigation	None	None
Discussion	<p>Safety consideration are of particular importance:</p> <p>Construction worker safety: Are a number of occupational safety risks associated with substation site construction, including the risk of electrocution. Compliance with the OH&amp;S Act would be required in terms of.</p> <p>Community safety: Potential risk of electrocution (people and livestock) if access to the site is not controlled. Safety and security threats posed by the presence of the construction camps/workers. Locals readily attribute increases in theft and other crimes to the presence of construction workers, particularly if these workers are from outside their area.</p>	

Nature of impact	Noise pollution	
Stage	Construction	Operation
Extent	Local	Local
Duration	Short term – the length of the construction period	
Probability of occurrence	Probable	

Nature of impact	Noise pollution	
Status of impact	Negative	-
Significance	Low	-
Mitigation measure	Any drilling and other construction activities should be limited to daylight hours. No construction activities on weekends, especially when close to communities. Ensure that all machinery is in good order and complies with generally accepted noise levels. Any high impact activity (such as the use of dynamite to blast rocky outcrops) would require prior warning to adjacent landowners. The impact of blasting activities is considered to be low, due to the extensive quarrying which is undertaken north-east of the substation site..	-
Significance after mitigation	None	None
Discussion	Construction is not anticipated to have a significant impact on ambient noise levels due to the substation being located a fair distance from townships/settlements.	

Nature of impact	Aesthetic quality	
Stage	Construction	Operation
Extent	Local	Regional
Duration	Short term	Permanent
Probability of occurrence	Highly probable	Highly probable
Status of impact	Moderate	Low
Significance	Moderate	Low
Mitigation measure	Construction site to be kept clean, and number and geographical “spread” of construction camps to be kept to a minimum..	Indigenous trees or shrubs to be planted around the substation area to shield the view. Mitigation to be applied at the design stage.
Significance after mitigation	Low	None
Discussion	Aesthetic quality and visual impact of an area is impacted on by the existing substation. The extension of the substation is not anticipated to add significantly to this impact. In addition, there are no townships or settlements in close proximity to the substation.	

Nature of impact	Sites of cultural, religious, historical or archaeological significance	
Stage	Construction	Operation
Extent	Local	None
Duration	-	-
Probability of occurrence	Improbable	None
Status of impact	Low	-
Significance	Low	-
Mitigation measure	A list of sites of archaeological, cultural and historic importance must be compiled. If a site is uncovered during construction, a qualified archaeologist must be alerted prior to construction continuing such that the site can be excavated and recorded. Required permits are to be obtained.	-
Significance after mitigation	Low - To be determined by the specialist post-construction.	-
Discussion	Archaeological sites are protected by the National Heritage Resources Act (No 25 of 1999). It is an offence to destroy, damage, excavate, alter or remove from its original position, or collect and archaeological material without a permit issued by the South African Heritage Resource Agency. Note must also be taken of the National Heritage Council Act (No 11 of 1999).	

### 6.9.1. Recommendations

In order to minimise the potential social impacts associated with the proposed 400 kV Transmission line between Ikaros and Bighorn Substations, it is recommended that, as far as possible, this new line be constructed in parallel to the existing Trident-Bighorn 275 kV line.

No significant impacts are anticipated to be associated with the extension of Bighorn Substation.

### 6.10. Conclusions and Recommendations

Table 6.8 below provides a summary of the recommendations made regarding the proposed Transmission lines between the proposed Ikaros Substation and the existing Bighorn Substation, and the extensions to the Bighorn Substation.

**Table 6.8:** Summary of findings regarding the proposed Transmission lines between the proposed Ikaros Substation and the existing Bighorn Substation, and the extensions to Bighorn Substation

Issue	Eastern Leg	Bighorn Substation
Climate and atmospheric conditions	Minimal impact on Transmission line infrastructure	Minimal impact on substation components
Geology and Soils	Potential erosion on slopes greater than 20°; site specific input for EMP	Potential for rocky outcrops; site specific input for EMP
Agricultural potential	Moderate agricultural potential	Minimal impact; erosion potential associated with steep slopes
Flora and fauna	Protected species in the vicinity of the norite hill complex; Site specific (EMP) input required	No impact as area is already disturbed as a result of the construction of Bighorn Substation
Avifauna	Line to be kept parallel to existing lines to reduce bird fatalities	No impact as area is already disturbed as a result of the construction of Bighorn Substation
Land use	Citrus and other farming activities; remain adjacent to existing line	No impact as area is already disturbed as a result of the construction of Bighorn Substation
Archaeological, cultural and historical sites	Stone walling close to norite hill complex and rivercourse. Site specific (EMP) input required	No impact as area is already disturbed as a result of the construction of Bighorn Substation
Visual	Disturbed habitat; follows other linear developments	No impact as existing visual impact is associated with Bighorn Substation
Social Environment	Impact of 3 Transmission lines in parallel on farmers; use of crop-spraying in area	No impact as area is already disturbed as a result of the construction of Bighorn Substation



Considering the findings of all the detailed studies undertaken, it is recommended that the Transmission lines between the proposed Ikaros Substation and the existing Bighorn Substation be constructed as close as possible south of the existing Trident-Bighorn 275 kV Transmission line.

No significant impacts are anticipated as a result of the planned expansions to Bighorn Substation, due to the existing disturbance which exists in the area.